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IS 6593 (1972): Electric Serological Water-baths [MHD 12:  
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IS : 6593 - 1972

*Indian Standard*  
**SPECIFICATION FOR**  
**ELECTRIC SEROLOGICAL WATER-BATHS**  
( First Reprint JULY 1982 )

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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 2, BAHADUR SHAH ZAFAR MARG  
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**AMENDMENT NO. 3 AUGUST 1998**  
**TO**  
**IS 6593 : 1972 SPECIFICATION FOR ELECTRIC**  
**SEROLOGICAL WATER-BATHS**

( *Page 3, clause 2.1, fourth line* ) -- Substitute 'ambient to 80°C' for '30 to 80°C'.

( MHD 14 )

Reprography Unit, BIS, New Delhi, India

# *Indian Standard*

## SPECIFICATION FOR

### ELECTRIC SEROLOGICAL WATER-BATHS

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(Continued from page 1)

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# Indian Standard

## SPECIFICATION FOR ELECTRIC SEROLOGICAL WATER-BATHS

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 30 June 1972, after the draft finalized by the Hospital Equipment Sectional Committee had been approved by the Consumer Products and Medical Instruments Division Council.

**0.2** This standard covers electrically heated water-baths designed specifically for serological work, such as the Kahn and Wassermann tests.

**0.3** The 'Indian Standard general and safety requirements for light electrical appliances (*third revision*)' (IS:302-1967) references to which have been made, is a necessary adjunct to this standard. Should, however, any deviation exist between the requirements of this standard and those of IS:302-1967\* provisions of the former shall apply.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

### 1. SCOPE

**1.1** This standard lays down the general, safety and performance requirements and tests for electric serological water-baths.

### 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions, in addition to those specified in IS:302-1967\*, shall apply.

**2.1 Water-Bath** — A thermally insulated container to accommodate test tube racks for the purpose of carrying out serological tests and fitted with one or more electric heating elements and a thermostat designed to maintain water at any temperature in the range of 30 to 80°C, controlled automatically within  $\pm 0.5^{\circ}\text{C}$ .

\*General and safety requirements for light electrical appliances (*third revision*).

†Rules for rounding off numerical values (*revised*).

**2.2 False Bottom** — The upper surface of any shelf, cover or stand supporting the test-tube rack in the water-bath.

**2.3 Working Space** — The space within the water-bath, above the false bottom and up to 25 mm below the inner top rim, unobstructed by any fittings except a thermometer.

**2.4 Cover** — The top cover of the water-bath which serves to minimize heat losses and evaporation.

**2.5 Water-Bath Temperature** — The mean of the temperatures of water at the centre of the working space.

**2.6 Temperature Variation** — The difference in temperature of the water at the centre of the working space and at any other point in the working space which is at least 10 mm away from the side walls.

**2.7 Temperature Differential** — The cyclic change of temperature at any point in the working space at least 10 mm away from the side walls of the water-bath, below the surface of water; the cyclic change being regulated by the operation of the thermostat.

**2.8 Temperature Drift** — The maximum change in the water-bath temperature which may take place in continuous operation over a long period.

### 3. SIZES

**3.1** Water-baths shall be manufactured in sizes as agreed to between the purchaser and the supplier.

### 4. RATING

**4.1 Voltage Rating** — The provisions of 3.1.2 of IS : 302-1967\* shall apply.

**4.2 Input Rating** — The rated input shall be not more than 2 kW.

### 5. MATERIAL

**5.1 Electrical Components** — The electrical components shall conform to relevant Indian Standards listed at 4.2 in IS : 302-1967\*.

**5.2 Inner Chamber, False Bottom and Cover** — These shall be of copper, brass or stainless steel. The stainless steel shall conform to Grade 04Cr19Ni9 of Schedule V of IS : 1570-1961†.

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\*General and safety requirements for light electrical appliances (third revision).

†Schedules of wrought steel for general engineering purposes.

**AMENDMENT NO. 2 AUGUST 1988**

**TO**

**IS : 6593-1972 SPECIFICATION FOR ELECTRIC  
SEROLOGICAL WATER-BATHS**

**5.3 Outer Enclosure** — The outer enclosure shall be of mild steel 0.8 mm thick or any other material of equivalent strength.

**5.4 Thermometer** — See serial No. 7 of Table 1 of IS : 2480-1964\*.

## 6. CONSTRUCTION

**6.1** Copper or brass if used for the inner chamber, false bottom and cover shall be not less than 0.8 mm thick and shall be electroplated with tin. Stainless steel, if used, shall be at least 0.5 mm thick.

**6.2** The brazing or soldering of the chamber shall precede tin plating. The brazed or soldered joints shall be sound and leak-proof.

**6.3** The inner chamber shall be marked indelibly with the minimum and maximum levels of water recommended.

**6.4** The cover shall be of pyramidal or gabled shape, and shall be so designed that any water condensing on its inner surface shall drip into the water-bath near its edges clear off the test-tube racks placed in it. If specifically desired by the purchaser, the lid may be hinged to the bath.

**6.5 Drain Cock or Plug** — The water-bath shall be provided with a drain cock or plug to facilitate the emptying and cleaning of the inner chamber when necessary. The cock or plug shall be so designed and located that the water is drained clear of the wiring or other components which could be damaged by contact with water.

**6.6 Thermal Insulation** — The inner chamber shall be encased in an outer enclosure leaving a gap of at least 25 mm on all sides and bottom, which shall be filled with an efficient thermal insulation such as foamed plastic or glass wool, which shall not deteriorate by ageing, water seepage or the operating-temperatures of the water-bath.

**6.7 Outer Enclosure** — The exterior of the outer enclosure, if made of mild steel or non-ferrous metal, shall be stove enamelled. The colour of the paint and the number of coats shall be subject to agreement between the purchaser and the supplier. Prior to painting, the surface shall be degreased, rust-proofed by phosphating and then suitably protected by an anti-corrosive primer either by brushing or by spraying. Each coat shall be separately stoved. The resulting finish shall be hard and shall not readily chip or flake.

**6.8** The heating elements shall be so located that the convection is efficient and the temperature variation shall be within limits laid down in 8.2. An electric stirrer or agitator may be provided to obtain the same result, if desired.

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\*Specification for general purpose glass thermometers.

**6.9** The heating element or elements shall be fitted to the water-bath with rubber or other washers or gaskets to prevent leakage of water through the joint, but soldering or welding shall not be done for this purpose, and the elements shall be easily replaceable.

**6.10 Wiring and Components** — The wiring and components of a water-bath shall be designed or fixed in such a manner that they do not deteriorate in service and endanger the safety of the user owing to the temperature to which they are likely to be exposed to while in use, or due to overflow of water from the water-bath.

**6.11** A pilot lamp shall be provided to indicate the operation of the thermostat. Another pilot lamp of a distinctly different colour shall be provided to indicate the operation of the mains circuit.

## **7. GENERAL AND SAFETY REQUIREMENTS**

**7.1 Protection Against Electric Shock** — The provisions of 8 of IS : 302-1967\* shall apply.

**7.2 Input** — The provisions of 9 of IS : 302-1967\* shall apply.

**7.3 Electrical Insulation** — The provisions of 11 of IS : 302-1967\* shall apply.

**7.4 Stability** — The provisions of 14.2 of IS : 302-1967\* shall apply.

**7.5 Mechanical Strength** — The provisions of 15 of IS : 302-1967\* shall apply.

**7.6 Supply Connections** — The provisions of 20 of IS : 302-1967\* shall apply.

**7.7 Terminals** — The provisions of 21 of IS : 302-1967\* shall apply.

**7.8 Earthing** — The provisions of 22 of IS : 302-1967\* shall apply.

**7.9 Screws and Connections** — The provisions of 23 of IS : 302-1967\* shall apply.

**7.10 Resistance to Rusting** — The provisions of 7.18 of IS : 302-1967\* shall apply.

**7.11 Protection Against Overflow of Water** — The water-bath shall pass the test specified in 10.9.

## **8. PERFORMANCE REQUIREMENTS**

**8.1 Heating-Up Time** — The heating-up time when determined in accordance with 10.8 shall not exceed 45 minutes.

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\*General and safety requirements for light electrical appliances (third revision).

**8.2 Temperature Variation** — When tested in accordance with 10.7.2, the temperature variation shall not exceed 0.5°C.

**8.3 Temperature Differential** — When tested in accordance with 10.7.2, the temperature differential shall not exceed 1°C.

**8.4 Temperature Drift** — When tested in accordance with 10.7.2, the temperature drift shall not exceed 0.5°C.

## 9. MARKING AND INSTRUCTIONS FOR USE

**9.1** Each water-bath shall be indelibly and clearly marked with the information prescribed in 25.1 of IS : 302-1967\*, on its outer surface or on a label firmly attached thereto.

**9.1.1** The water-bath may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

**9.2 Instructions for Use** — Each water-bath shall be provided with the necessary instructions, including precautions to be taken, for its proper use. If the thermostat had adjustments for its range and sensitivity, or if a change of capsules is necessary to cover the full range, the instructions for carrying out such adjustments or changes shall also be included.

## 10. TESTS

### 10.1 Categories of Test

**10.1.1 Type Tests** — The tests specified in 10.5 shall constitute type tests and shall be carried out on five samples of water-baths of the same model, type and size ( selected preferably at random from a regular production batch ).

**10.1.1.1 Criteria of acceptance** — Samples shall successfully pass all the type tests for proving conformity with the requirements of this standard. If any sample should fail in any of the type tests, the testing authority at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all the tests or to the tests in which failure occurred. No single failure shall be permitted in the repeat tests.

\*General and safety requirements for light electrical appliances ( third revision ).

**10.1.2 Acceptance Tests** — The following shall constitute acceptance tests:

<i>Tests</i>	<i>Clause Reference</i>	
a) Visual examination and inspection	10.6	
b) Heating-up time	10.8	
c) Temperature variation, differential and drift	10.7.2	of this specification
d) High voltage	41.1	
e) Insulation resistance (dry)	41.3	
f) Protection against electric shock	38	
g) Leakage current	40	
h) Earthing connection	36	
j) Input	43	

**10.1.3 Routine Tests** — The following shall constitute routine tests:

<i>Tests</i>	<i>Clause Reference</i>	
a) Visual examination and inspection	10.6	of this specification
b) Protection against electric shock	38	
c) High voltage test	41.1	
d) Insulation resistance test	41.3	
e) Leakage current	40	
f) Earthing connection	36	
g) Input	43	
h) Temperature differential	10.7.2	of this specification

## 10.2 General Conditions of Tests

**10.2.1** The provisions of 26 of IS : 302-1967\* shall apply.

**10.2.2 Ambient Temperature** — The ambient temperature for the performance tests shall be  $27 \pm 5^{\circ}\text{C}$ .

**10.2.3 Thermometers for Carrying Out Tests** — See Schedule Mark 22 and 23 of Table 1 of IS : 4825-1968†.

**10.2.4 Arrangement of the Water-Bath** — The water-bath shall be tested on a table or stand one metre above floor level and located so as to be protected from direct sun rays or draughts, when carrying out the performance tests. It should have the false bottom and the cover fixed in position, with water filled up to 35 below the inner rim.

**10.2.4.1** For the purpose of the tests the regular cover may, if necessary, be substituted with another one of identical type and size but having tabulars for insertion of thermometers as required by 10.7.

\*General and safety requirements for light electrical appliances (third revision).

†Specification for laboratory and reference thermometers.

**10.3 Measurement of Temperatures** — The measurement of temperatures for the purpose of the performance tests (10.7) shall commence 30 minutes after the last adjustment of the thermostat, at each test temperature.

**10.4 Test Temperatures** — The temperature variation test, temperature differential test, and temperature drift test shall be performed at 37°C and at 56°C.

**10.5 Schedule of Tests** — The schedule of tests to be carried out on water-baths for proving conformity with this standard is given below with references to relevant clauses of this standard, or of IS : 302-1967\*.

<i>Test</i>	<i>Clause Reference</i>
a) Visual examination and inspection	10.6
b) Heating-up time	10.8
c) Overflow	10.9
d) Temperature variation, differential and drift	10.7
	} of this specification
e) Stability	14.2
f) Resistance to rusting	35
g) Mechanical strength	34
h) High voltage	41.1
j) Insulation resistance (dry)	41.3
k) Protection against electric shock	38
m) Leakage current	40
n) Earthing connection	36
p) Input	43
q) Screws and connections	33.1
	} of IS : 302-1967*

**10.6 Visual Examination and Inspection** — The water-bath shall be inspected and examined visually (with the aid of measuring instruments and gauges, if necessary) for compliance with 5, 6, 7 and 9 at the commencement and end of the whole series of tests.

**10.7 Performance Tests** — For the purpose of these tests nine thermometers shall be fixed on the water-bath so that their sensitive bulbs are located, one each at the following positions:

- a) At the centre of the working space, Thermometer No. 1.
- b) At the four corners of the working space, in the level with Thermometer No. 1, and 10 mm away from each side wall; Thermometers No. 2, 3, 4 and 5 respectively.
- c) At the horizontal centres of the four side walls in level with Thermometer No. 1 and 10 mm away from each side wall, Thermometers No. 6, 7, 8 and 9 respectively.

\*General and safety requirements for light electrical appliances (third revision).

**10.7.1** When the temperature differential test is done as a routine test only one thermometer may be used, employing the fixing arrangement provided by the manufacturer.

**10.7.2** *Temperature Variation, Differential and Drift Tests* — The water-bath arranged in conformity with 10.2 and 10.3 shall be switched on and the water-bath temperature shall be controlled at 37°C by adjusting the thermostat following the manufacturer's instructions. The test shall commence 30 minutes after the final adjustment of the thermostat and shall be carried out as follows:

- a) The temperature at position 1 and 2 shall be read in quick succession at three consecutive cut-outs of the thermostats, and the maximum difference of temperatures at the two positions shall be the temperature variation at position 2. The temperature variation at each of the other positions 3 to 9 shall be similarly read and noted. The maximum temperature variation at any of these points shall be the temperature variation of the water-bath.
- b) The temperature at each of the 9 positions shall then be read at a cut-in and again at the cut-out immediately following the cut-in, the difference between each pair of readings being noted as the temperature differential at that position. The temperature differential at each position shall be measured and recorded at least thrice during the whole test with a minimum interval of 30 minutes between successive measurements at the same position. The maximum differential recorded at any position during the whole test shall be the temperature differential of the water-bath. When performed as a routine test, however, the temperature differential shall be measured with only one thermometer as specified in 10.7.1 and three measurements shall be done at the same positions with an approximate interval of 15 minutes, and the maximum differential obtained shall be taken as the differential of the water-bath.
- c) The temperature at position 1 shall be read and recorded immediately following a cut-out of the thermostat from the commence of the test, approximately every 30 minutes for 6 hours. The maximum difference observed during this period shall be the temperature drift of the water-bath.
- d) All the above tests shall be repeated with the water-bath temperature at 56°C.

**10.8 Heating-Up Time** — The water-bath shall be filled up with water to a height 25 mm below the inner top rim and kept on a level surface. It shall then be exposed to an ambient temperature of  $27 \pm 5^\circ\text{C}$  for at least 8 hours. It shall then be connected to the electric supply with the

thermostat adjusted to its maximum position and the voltage regulated so that the rated power input is fed into the elements. The time required to raise the water-bath temperature to 80°C shall be the heating up time of the water-bath.

**10.9 Overflow Test** — At the end of the above test, water heated to approximately 80°C shall be added to the water-bath till a very small quantity overflows. A further 250 ml of water shall then be poured quickly but in a steady stream over the centre of the water surface in the water-bath. When the overflow has ceased, water shall be syphoned or drained out till the level is again 25 mm below the inner top rim. The outer accessible surface shall be wiped dry with a cloth, and the water-bath shall be subjected to the tests (h), (j) and (m) given in 10.5. It shall pass these tests.



AMENDMENT NO. 1 OCTOBER 1985

TO

IS: 6593-1972 SPECIFICATION FOR ELECTRIC  
SEROLOGICAL WATER-BATHS

(Page 4, clause 5.2) – Substitute the following  
for the existing first sentence:

'These shall be of copper, brass, stainless steel  
or any other material suitable for the purpose.'

(CBDC 14)

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Reprography Unit, ISI, New Delhi, India

# INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

## Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 1 kg.1 m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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